

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application of : Takuro SEKIYA

Serial No. : 08/547,904

Group Art Unit: 2853

Date Filed : October 25, 1995

Examiner: J. Nguyen

For : INKJET RECORDING HEAD ADAPTED FOR IMPROVED
PRECISION OF MOUNTING

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APPELLANT'S BRIEF

Sir:

This is an appeal from the final rejection of all of the claims in this application (claims 1, 3-5, 9 and 12) under 35 U.S.C. §103(a).

1. Real Party In Interest

This application is assigned to Ricoh Company, Ltd., a corporation of Japan.

2. Related Appeals And Interferences

No related appeals or interferences are pending. This application was not involved in any prior appeals or interferences.

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3. Status of Claims

Claims 1, 3-5, 9 and 12 are pending, with claims 1 and 12 being in independent form.

All pending claims are rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 5,245,361 to Kashimura et al. in view of U.S. Patent No. 4,931,811 to Cowger et al.

4. Status Of Amendments

The Amendment After Final Rejection filed on August 14, 1998 in response to the Final Office Action dated May 26, 1998 has been entered by the Examiner as noted in the Advisory Action dated August 24, 1998. The Amendment overcomes the rejections under 35 U.S.C. §112, second paragraph, in the Final Office Action.

5. Summary Of The Invention

The claimed invention is a recording head for an inkjet recording apparatus for recording an image on an object. A non-limiting example of a device supporting the claimed limitations at issue is illustrated in Figs. 1-3 and 8, which are reproduced below:

FIG. 1

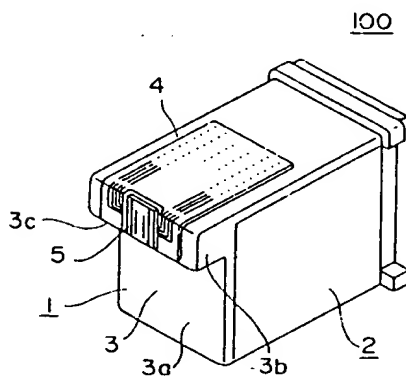


FIG. 2

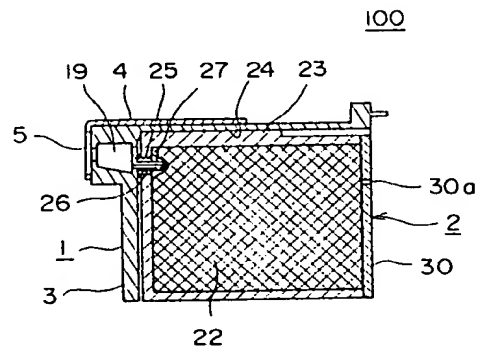


FIG. 3

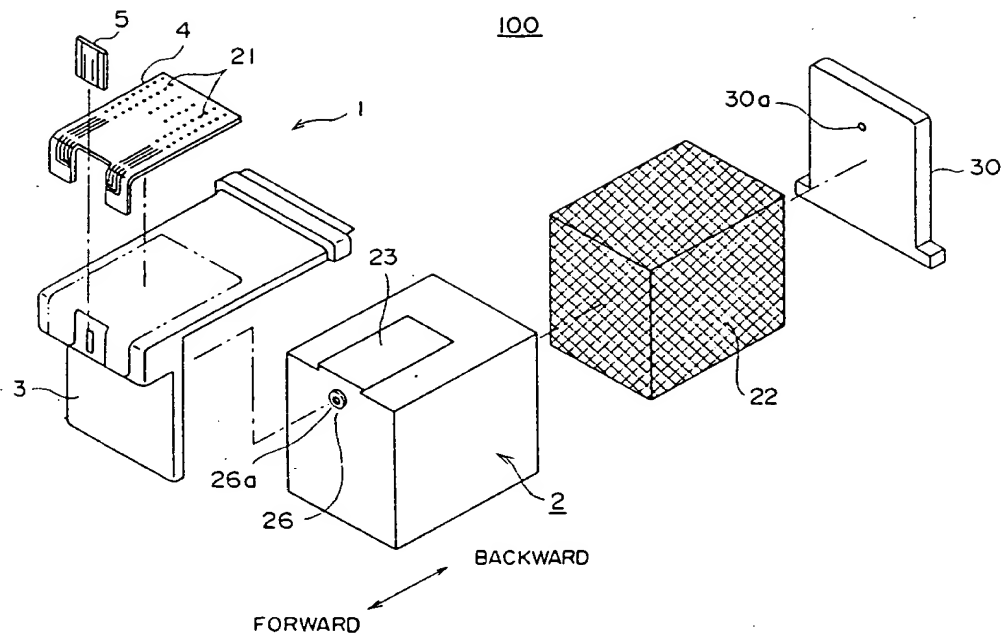
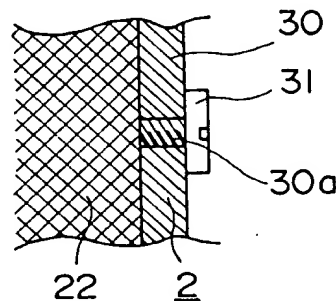


FIG. 8



The recording head 100 includes a recording head unit 1 and an ink reservoir unit 2. The recording head unit 1 includes a base part 3 that carries thereon a flexible printed circuit board 4 and a head chip 5. The ink reservoir unit 2 is formed so as to be mounted detachably

upon the base part 3 of the recording head unit 1 to form a unitary recording head 100. More specifically, in order to mount the ink reservoir unit 2 upon the base part 3 of the recording head unit, the ink reservoir unit 2 is provided with a guide part 23 that projects upward on the top surface of the unit 2 as shown in Fig. 3. Base part 3 has a front plate and a top plate for fitting the front and top surfaces of the reservoir 2, respectively. A depression 24 is provided on the lower surface of the top plate of base part 3 in correspondence to the projection 23 as a corresponding guide part. The guide part 23 forms a guide rail extending from the front surface toward the rear surface on the top surface of the ink reservoir unit 2, and a corresponding guide groove forming the guide part 24 extends in the forward direction from the rear edge of the top plate of the base part 3 (page 17, lines 2-14).

When assembling the ink reservoir unit 2 and the recording head unit 1 together, the ink reservoir unit 2 is attached to the base part 3 such that the front edge of the guide part 23 is accepted by the rear edge of the guide part 24. The ink reservoir unit 2 is then pushed forward with respect to the base part 3 until the tubular member 27 is fully inserted into the reservoir unit 2 via the inner hole 26a of the elastic ring 26 (page 17, lines 15-23). The ink reservoir unit 2 includes a vent 30a closed by a removable seal member 31 (Fig. 8), for example. The seal member 31 prevents evaporation of ink in the ink reservoir during transportation and storage (page 23, lines 7-19).

The ink reservoir unit 2 is thus removably mounted to base part 3 of the recording head unit 1 and is detachable therefrom by simply pulling it out in a backward direction. The user of the inkjet printer can thus replace just the ink reservoir unit by simply removing an old ink

reservoir unit from the base part 3 of the recording head unit 1 and replacing it with a new one.

For convenience of understanding of the claimed invention, the following is a reading of independent claim 1 on the specification of the present application. Of course, the claims are not intended to be limited in any way by this reading. The subject matter of the rejected claims relates to a recording head of an inkjet recording apparatus for recording an image on an object. The recording head comprises a recording head unit 1 supplied with ink for recording an image on a recording object by forming a jet of the ink. The recording head unit comprises a nozzle 20 for ejecting the jet, a passage 16 (Fig. 6) of ink provided in communication with the ink nozzle 20 for supplying the ink to the nozzle, an energization part 9 provided on the passage for applying energy to the ink in the passage to form the jet and an ink inlet 27 formed in communication with the passage for receiving the ink, the inlet including therein filter means 29 which is made from stainless steel mesh for eliminating particles from the ink supplied to the inlet. An ink reservoir unit 2 holds the ink. The ink reservoir supplies the ink held therein to the inlet of the recording head part, the ink reservoir accommodating therein a material 22 infiltrated with the ink. The recording head unit 1 carries thereon first connection means 24 as a part of the recording head unit, for connecting the recording head unit 1 to the ink reservoir unit 2. The ink reservoir unit 2 carries thereon second connection means 23 corresponding to the first connection means 24 as a part of the ink reservoir unit, for connecting the ink reservoir unit 1 to the recording head unit 2. The first and second connection means are formed so that the first and second connection means establish, when the ink reservoir unit is mounted upon the recording head unit, a detachable engagement with each

other in a manner, such that the ink in the reservoir unit flows to the passage in the recording head unit (page 17, line 23 - page 18, line 4). A carriage member 32 (Fig. 10) is constructed so as to be mounted upon an image recording apparatus for carrying thereon the recording head unit and the reservoir unit together detachably in the state that the recording head unit and the reservoir unit are connected with each other detachably such that the reservoir unit connected to the recording head unit is removable therefrom. The carriage member has a positioning part (cutout 36, Fig. 9) for determining a position of the nozzle of the recording head unit with respect to the carriage member. The ink reservoir 2 carries a vent 30a (Fig. 2). The recording head unit has a positioning part (front projecting part of base part 3) for engagement with the positioning part of the carriage member. The recording head unit carries thereon electrode contacts 21.

The claimed combinations of features in the appealed claims bring about important advantages that were previously not achieved or recognized in the prior art. For example, some conventional inkjet recording printers have a recording head for ejecting ink and an ink reservoir for holding the ink. The ink reservoir is formed separate from the recording head and ink is supplied from the ink reservoir to the recording head via an interconnection tube. However, such an inkjet recording system requires the use of a complex interconnection tube system and results in an increased size of the recording system. In addition, replacing the ink reservoir is a substantial task (Applicant's specification, page 2, lines 8-21).

Another conventional type of inkjet recording printer includes a recording head fixed upon the ink reservoir (this type of system is described in Kashimura et al.) The recording head and ink reservoir form an integral cartridge. This type of inkjet system eliminates the

interconnection tube between the head and the ink reservoir and thus simplifies the system's construction and the overall size of the system can be reduced. However, when the ink supply is exhausted, such an integral cartridge including the recording head and the ink reservoir must be replaced. Since the recording head is typically much more expensive compared with the ink reservoir, such an integral construction is relatively expensive to replace, although the work necessary to replace the ink cartridge may be substantially reduced (specification, page 2, line 22 - page 3, line 15).

The present invention completely solves such problems in inkjet recording heads and reduces the cost of maintaining and operating an inkjet recording system. According to the invention, these benefits are achieved through the provision of an inkjet head that is detachable from the ink reservoir. Accordingly, when ink supply in the ink reservoir is exhausted, only the ink reservoir need be discarded and the ink reservoir can be replaced with a new one. This saves the cost of having to replace the relatively more expensive inkjet head each time the ink in the ink reservoir is exhausted.

6. Issues

Whether the claims are patentable under 35 U.S.C. §103(a) over U.S. Patent No. 5,245,361 to Kashimura et al. in view of U.S. Patent No. 4,931,811 to Cowger et al.

7. Grouping Of The Claims

At least independent claim 1, dependent claim 9 and independent claim 12 are believed to be separately patentable from each other, as discussed below.

8. Argument

**The claims are patentable under 35 U.S.C. §103(a) over
Kashimura et al. in view of Cowger et al.**

The applied references do not teach or suggest the claimed invention.

Kashimura et al. relates to a mounting arrangement for positioning an ink jet recording head with integral ink tank when the head is mounted to a carriage. Kashimura et al. recognized in the prior art a disposable ink jet recording head comprising internally an integrated combination of an ink tank for housing ink and a head element for discharging ink (col. 1, lines 17-23). Kashimura et al. then describe examples of mounting methods for mounting such ink jet recording heads onto a carriage of a recording device.

However, no teaching could be found in Kashimura et al. that the recording head unit is detachable from the ink reservoir unit as recited in appealed claim 1, or detachably mounting the ink reservoir upon the recording head unit as recited in appealed claim 12, or of a recording head unit including electrode contacts such that when mounting the recording head unit and ink reservoir on the carriage electrical contact is made between the electrode contacts on the recording head unit and electrode contacts on the carriage as also recited in appealed claim 12.

Cowger et al. relates to a thermal ink jet pen. A cap covers a housing of the ink jet pen, the housing including a foam material for storing ink. The cap has an air vent tube in a central portion thereof for supplying and replenishing air to the foam storage material as ink is removed therefrom during an ink jet printing operation. Cowger et al. was cited as teaching a vent closed by a removable seal member for supplying and replenishing air to the ink

reservoir. However, no teaching could be found in Cowger et al. of a vent that communicates an interior and an exterior of an ink reservoir unit, the vent being closed by a removable seal member, as recited in dependent claim 9, or of removing such a seal member such that the interior space of the ink reservoir communicates directly with an exterior of the ink reservoir via the vent, as recited in independent claim 12.

It is respectfully submitted that the Examiner has erred in fundamental respects in rejecting the claims of this application. The Examiner is mistaken in concluding that the primary reference, Kashimura et al., suggests forming the recording head unit and the reservoir unit detachable from each other, and teaches or suggests a recording head unit including electrode contacts such that when mounting the recording head unit and ink reservoir on the carriage electrical contact is made between the electrode contacts on the recording head unit and electrode contacts on the carriage. The Examiner is also mistaken in concluding that the cited art discloses a vent closed by a removable seal member. Each of these issues is discussed in more detail below.

A. The Cited Art Does Not Teach Or Suggest An Ink Reservoir Unit And A Recording Head Unit Detachable From Each Other

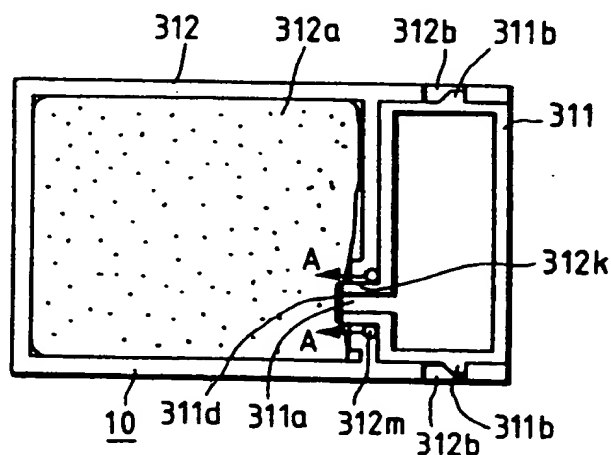
Kashimura et al. is concerned with a mounting arrangement for positioning an ink jet recording head to a carriage. The portion of Kashimura et al. cited in the rejection of the appealed claims is Fig. 17 (reproduced below) and its corresponding text at column 16, line 38 through column 18, line 49. Fig. 17 of Kashimura et al. shows an ink jet head including a head element 311 and an integrated ink tank 312 (column 16, lines 40-42). When connecting

the head element 311 and the ink tank 312, the head element is urged into the ink tank 312 in the direction shown by arrow A in Fig. 17. The wall portion of the ink tank provided with opening 312b expands outwardly due to engagement of projection 311b provided on head element 311. At the same time, communication pipe 311a penetrates feeding inlet 312k. When projection 311b and opening 312b reach the position where they are completely opposed to each other, the wall portion is restored to its original position because of the spring characteristics of the material forming the wall portion. Connecting terminal 311e for supplying electrical signals is arranged within head element housing portion 310a of ink tank 312 (col 16, lines 60-66).

As described in Kashimura et al.:

“According to the constitution as described above, only by pushing the head element 311 relative to the ink tank 312 in the direction shown by the arrowhead A in FIG. 17, connection of the both can be effected without requiring any step such as adhesion, etc.” (Column 18, lines 19-23)

FIG. 17



However, it is noted that only one side of projection 311b has a tapered surface (see Fig. 17). More specifically, only the side of projection 311b being initially inserted into the ink tank 312 has the tapered surface. The tapered surface of projection 311b expands the ink tank walls until projection 311b and the opening 312b reach the positions where they are completely opposed to each other. The wall portion is then restored to the original position. However, since only the side of projection 311b which is initially inserted into the ink tank 312 has a tapered surface, it will be appreciated that the projection and opening attachment shown in Kashimura et al. provide a permanent joining of the ink tank and the ink jet head. Kashimura et al. is able to make the connection without requiring an adhesion step (Col. 18, lines 19-23). Kashimura et al. fails to teach any desirability or reason for making the inkjet head detachable from the ink reservoir unit. Kashimura et al. is completely silent as to separating the ink tank from the ink jet head once joined. Accordingly, Kashimura et al. would have provided absolutely no teaching or suggestion to do so. It is only the result of impermissible hindsight that allows the suggestion that it would have been obvious to make the inkjet head detachable from the ink reservoir unit.

In re Dulberg, 289 F.2d 522, 129 USPQ 348, 349 (CCPA 1961) was cited in the final rejection for the proposition that merely making the head and the reservoir detachable from each other without special functional significance is not patentable.

In re Dulberg is clearly distinguishable from the present case. The invention in the Dulberg application related to a holder for soft sticks such as lipsticks. The holder included relatively rotatable inner and outer sleeves and a carrier which engages one end of the lipstick, the carrier being mounted within the inner sleeve. The sleeves and carrier are open at both

ends. The carrier is provided at one end with an inwardly extending annular bead which serves as a stop for an end of a lipstick inserted from the other end of the carrier. When a worn lipstick is to be replaced, a pencil or similar instrument may be inserted through the annulus of the bead portion of the carrier to push the remaining old lipstick out of the carrier, after which a new lipstick may be inserted. The art cited by the Examiner included the Noble patent which showed inner and outer sleeves, a carrier and a removable end cap. However, Noble did not show a carrier including a bead or similar restriction. The Peterson patent showed an arrangement of relatively rotatable inner and outer sleeves and carrier similar to appellant's but with one end closed by a cap said to be held in place by a "pressed fit". The carrier described in Peterson included an inwardly extending annular bead which limits movement of the lipstick in one direction and the end of the carrier adjacent the bead is open.

In an earlier decision, the Board found that the patent to Peterson fully met the terms of the appealed claims if the cap which was said to be "press fitted" is removable. The appellant contended that in a press fit the parts fit so tightly that they cannot be manually removed and that accordingly one end of Peterson's assembly is permanently closed by the cap, so that there is no opening extending longitudinally through the holder, as required by the claims.

However, in the Dulberg case, the claims did not recite a removable cap. The actual issue in Dulberg was whether the prior art teaching of the carrier provided with an inwardly extending annular bead which limits movement of the lipstick in one direction, as disclosed in Peterson, could be properly applied in the rejection of the claims, regardless of the fact that Peterson disclosed "press fitting" a cap in place. That is, because the cap was "press fit" in place, the issue was whether the structure shown in Peterson included an opening extending

longitudinally through the holder that permitted an instrument to push against the bottom of the stick (e.g., lipstick) for ejecting it through the carrier, as recited in Dulberg's appealed claims.

In re Dulberg does not support the position that making the head and reservoir detachable from each other without special functional significance is not patentable, as suggested in the final Office Action.

In any event, the features of the claims presently on appeal do provide special functional significance. In the present case, claim 1 expressly requires that the recording head unit and the reservoir unit are connected with each other detachably such that the reservoir unit connected to the recording head unit is removable therefrom. Claim 12 expressly recites detachably mounting the ink reservoir upon the recording head unit. As described above, these features provide clear and important functional significance and each feature of the claims should be considered in determining the patentability of the claims. No claimed element should be overlooked in determining patentability. The cited references do not teach each of the elements of the appealed claims.

B. The Cited Art Does Not Teach Or Suggest
 Providing Electrode Contacts On the Recording Head Unit

Independent claim 12 recites the step of mounting the recording head unit and ink reservoir on the carriage such that electrical contact is made between electrode contacts on the recording head unit and electrode contacts on the carriage. Independent claim 12 is separately patentable as it recites an additional feature and provides a novel method that differs for reasons in addition to those described above. In Kashimura et al., connecting terminal 311e

appears to be arranged within the head element housing portion 310a of ink tank 312 and not on the recording head unit itself. The terminal 311e makes contact with a connecting terminal 320a and not with carriage 20. Accordingly, Kashimura et al. fails to teach making electrical contact between electrode contacts on the recording head unit and electrode contacts on the carriage, as recited in claim 12.

C. The Cited Art Does Not Teach Or Suggest
A Vent Including A Removable Seal Means

Independent claim 12 recites a method of recording an image on an object with an inkjet recording apparatus, the apparatus including a recording head unit and an ink reservoir. The ink reservoir is constructed to be mounted to the recording head unit detachably therefrom and carries a vent closed by a seal member. The method includes a step of detachably mounting the ink reservoir upon the recording head unit, mounting the recording head unit and ink reservoir on a carriage and removing the seal member such that an interior space of the ink reservoir communicates directly with an exterior of the ink reservoir via the vent. Independent claim 12 is also separately patentable as it recites an additional feature and provides a novel method that differs from the prior art for reasons in addition to the reasons described above. That is, Kashimura et al. and Cowger et al. do not teach or suggest a removable seal member closing a vent.

Accordingly, Applicant finds no teaching or suggestion of detachably mounting the ink reservoir upon the recording head unit, mounting the recording head unit and ink reservoir on

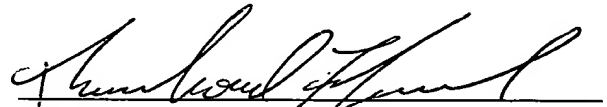
the carriage and removing the seal member which closes the vent on the ink reservoir, such that an interior space of the ink reservoir communicates directly with an exterior of the ink reservoir via the vent, as recited in claim 12.

Claim 9 depends from claim 1 and additionally recites an ink reservoir vent that communicates an interior and an exterior of the ink reservoir unit, the vent being closed by a removable seal member. This feature is independently patentable as this feature adds to what parent claim 1 recites to provide a novel combination that differs from the prior art. In Kashimura et al. and Cowger et al., for example, this combination could not be found at least because a vent having a removable seal member is not taught or suggested therein.

9. Appendix

The appealed claims are reproduced in the Appendix attached hereto.

Respectfully submitted,



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APPENDIX

The appealed claims 1, 3-5, 9 and 12 are reproduced below:

1. A recording head of an inkjet recording apparatus for recording an image on an object, comprising:

a recording head unit supplied with ink for recording an image on a recording object by

forming a jet of the ink, said recording head unit comprising:

a nozzle for ejecting said jet;

a passage of ink provided in communication with said ink nozzle for supplying

said ink to said nozzle;

an energization part provided on said passage for applying energy to said ink in

said passage to form said jet; and

an ink inlet formed in communication with said passage for receiving said ink,

said inlet including therein filter means which is made from stainless

steel mesh for eliminating particles from said ink supplied to said inlet;

and

an ink reservoir unit for holding therein said ink, said ink reservoir supplying

said ink held therein to said inlet of said recording head part, said ink

reservoir accommodating therein a material infiltrated with said ink;

said recording head unit carrying thereon first connection means as a part of

said recording head unit, for connecting said recording head unit to said

ink reservoir unit;

said ink reservoir unit carrying thereon second connection means corresponding

to said first connection means as a part of said ink reservoir unit, for connecting said ink reservoir unit to said recording head unit;

said first and second connection means being so formed that said first and second connection means establish, when said ink reservoir unit is mounted upon said recording head unit, a detachable engagement with each other in a manner, such that said ink in said reservoir unit flows to said passage in said recording head unit; and

a carriage member constructed so as to be mounted upon an image recording apparatus for carrying thereon said recording head unit and said reservoir unit together detachably in the state that said recording head unit and said reservoir unit are connected with each other detachably such that said reservoir unit connected to said recording head unit is removable therefrom, said carriage member having a positioning part for determining a position of said nozzle of said recording head unit with respect to said carriage member, and wherein said ink reservoir carrying a vent;

said recording head unit having a positioning part for engagement with said positioning part of said carriage member,

said recording head unit carrying thereon electrode contacts.

3. A recording head as claimed in claim 1, wherein said positioning part of said carriage member forms a mechanical engagement with said recording head unit on which said

nozzle is formed.

4. A recording head as claimed in claim 3, wherein said carriage member carries thereon an interconnection pattern for carrying electric signals, said electrode contacts on said recording head unit thereby establishing an electrical contact with said interconnection pattern of said carriage member when said recording head unit and said ink reservoir unit are mounted upon said carriage member.

5. A recording head as claimed in claim 1, wherein said recording head unit has a first guide part for guiding said ink reservoir unit with respect to said recording head unit for mounting and dismounting said ink reservoir unit on and from said recording head unit, said ink reservoir unit having a corresponding second guide part for engagement with said first guide part.

9. A recording head as claimed in claim 1, wherein said ink reservoir vent communicates an interior and an exterior of said ink reservoir unit, said vent being closed by a removable seal member.

12. A method for recording an image on an object by means of an inkjet recording apparatus, said inkjet recording apparatus including a recording head unit carrying thereon an ink nozzle for forming an inkjet and an ink reservoir for storing ink, said ink reservoir being so constructed as to be mounted upon said recording head unit detachably therefrom and

carrying a vent closed by a seal member, said recording head unit carrying a stainless mesh filter on an inlet of said ink, said recording head unit including a positioning part for positioning said recording head unit on a carriage, and electrode contacts, said method comprising the steps of:

detachably mounting said ink reservoir upon said recording head unit such that the ink in said ink reservoir is supplied to said recording head unit;

mounting said recording head unit and ink reservoir on said carriage such that said positioning part of said recording head unit engages a positioning part of said carriage for positioning said recording head unit with respect to said carriage such that electrical contact is made between said electrode contacts on said recording head unit and electrode contacts on said carriage; and

removing said seal member such that an interior space of said ink reservoir communicates directly with an exterior of said ink reservoir via said vent.